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Classification, Natural History, and Evolution of Epiphloeinae (Coleoptera: Cleridae). Part V. *Decorosa* Opitz, a New Genus of Checkered Beetles from Hispaniola with Description of Its Four New Species

WESTON OPITZ[1]

ABSTRACT

The new genus *Decorosa* Opitz, known only from the Dominican Republic, and its four new species are described: *D. aladecoris*, *D. iviei*, *D. limatula*, and *D. neiba*. Reduction of the seventh row of elytral punctations and filiform funicular antennomeres distinguish *Decorosa* specimens from other epiphloeines with antennae composed of 10 antennomeres. Aside from the conventional components of generic revisions this treatise also includes a review of Greater Antillean and Hispaniolan paleogeography, and comments about phylogenetics and zoogeographic considerations.

Distributional records, in conjunction with analysis of intrageneric relationships suggest that *Decorosa* evolved in northern Hispaniola. Available specimens of *Decorosa* were collected from mountain forests of the Cordillera Central (1160–2885 m), Sierra de Neiba, (1856–1874 m), and from eastern terrain prehistorically considered part of the northern element of ancient Hispaniola. Compelling evidence from geology and biology suggests that extant Hispaniola was prehistorically composed of a northern and southern island. It is suggested that ancestral *Decorosa* split into the *limatula-iviei* and *decorosa-neiba* stocks in the more northern ancient terrain of Hispaniola. Subsequently, each of two ancestral lineages yielded at least two sister species. It is further postulated that there occurred two dispersal events that brought one species of each sister pair to more southern Hispaniola; *limatula* from the *limatula-iviei* lineage and *neiba* from the *aladecoris-neiba* lineage.

[1] Kansas Wesleyan University, Department of Biology, 100 East Claflin Avenue, Salina, KS 67401-6196 (opitz@kwu.edu).

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RESUMEN

El género nuevo *Decorosa*, de distribución restringida a Republica Dominicana, y sus cuatro nuevas especies son descritos: *D. aladecoris*, *D. iviei*, *D. limatula*, y *D. neiba*. Tres características discriminan los especimenes de *Decorosa* de otros Epiphloeinae: antenas compuestas de 10 antenomeros, reducción de la séptima línea de puntuaciones y antenomeros funiculares filiformes. Además de los elementos convencionales de una revisión genérica, este trabajo incluye una revisión de la paleogeografía de Hispaniola y las Grandes Antillas, así como comentarios sobre la filogenia y la zoogeografía del género. Cuarenta dibujos, incluyendo cuatro de especimenes enteros, una micrografía electrónica, una fotografía, un mapa y un árbol filogenético ilustran el trabajo. Las características morfológicas son polarizadas filogenéticamente, organizadas en una matriz de caracteres y analizadas en una hipótesis filogenética intragenérica, contrastada con un outgroup compuesto por los demás géneros de Epiphloeinae con antenas de 10 antenomeros.

La distribución geográfica, en conjunto con el análisis de relaciones intragenérico, sugiere que el grupo ancestral de *Decorosa* incluye el norte de Hispaniola. Los especimenes disponibles de *Decorosa* fueron colectados en las selvas de montañas de la Cordillera Central (1160–2885 m), en la Sierra de Neiba (1856–1874 m), y en terrenos del este, considerados prehistóricamente como parte del elemento norte de la antigua Hispaniola. Existe evidencias geológica y biológica que sugieren que la actual Hispaniola era prehistóricamente compuesta de una isla norte y una isla sur. Se sugiere que los ancestros de las especies del género *Decorosa* se separaron en el grupo *limatula-iviei* y el grupo *decorosa-neiba* en la parte más norte de Hispaniola. Posteriormente, cada linaje dio origen a por lo menos dos especies hermanas. Se postula que ocurrieron dos eventos de dispersión, que empujaron una especie de cada par de especies hermanas más hacia el sur de Hispaniola; *limatula* del linaje *limatula-iviei* y *neiba* del linaje *aladecoris-neiba*.

INTRODUCTION

Despite the long history of entomological research in Hispaniola there remains a dearth of information about the diversity of Cleridae on the island. Not one species is listed from that island in the world catalogue of Corporaal (1950). I became interested in the entomofauna of this island as a result of my studies of the new world subfamily Epiphloeinae, which occur on many of the Caribbean islands.

My commitment to make knowledge available incrementally about this monophyletic lineage of the Cleridae, the epiphloeines, has involved lengthy periods of specimen accumulation. Insufficient number of specimens may at times be a considerable deterrent toward credible hypotheses of the biological species. It also minimizes the opportunity for discussions of a taxon's evolution and biogeography. This is particularly relevant among the anatomically homogeneous components of epiphloeine species (Opitz, 2004: 7). Adequately representing the full geographic range of these checkered beetles is imperative for their biological study so that a hypothesis about their species concept may be credible and, thus, their ecological role may be most usefully evaluated. Extraordinary efforts in cooperation from colleagues have greatly facilitated this goal. Their loans, exchanges, and gifts have greatly enhanced my research progress.

Elsewhere, I (Opitz, 2005: 8; 2007: 79) allude to difficulties one usually encounters in attempts to collect Cleridae, with frequent capture events of a single individual or no specimens at all. Therefore, loans from museums and private collections have been the primary source of my research material. In recent months, I was delighted to receive an assortment of checkered beetles from Robert Davidson, Michael A. Ivie, and Philip Perkins, on whose specimens this study is based.

MATERIALS AND METHODS

This contribution is based on 16 adult specimens of *Decorosa*. Unfortunately, small sample sizes are common in taxonomic revisions of the Cleridae because species of many genera are often collected in increments of one. One specimen of *D. iviei*, n. sp., the type species, was completely disarticulated to establish the basic anatomical characteristics of the genus. All male specimens were dissected to determine aedeagal and spicular fork structure. The primary type specimen of *Decorosa aladecoris*, n. sp., was prepared with legs and antennae symmetrically arranged for photography with a Nikon DXM1200 digital

camera attached to a Leica MZ microscope. The scale bar with morphological illustrations represent 1 millimeter.

The rationale to identify biological species and to predict phylogenetic relationships is similar to those expressed in earlier works (Opitz, 2006: 84. 2007: 84). I use "homoplasic apotypy" to define those characteristics that I presume evolved independently in evolutionarily distant taxa conglomerates. The rational and justification for the use of such apotypies will be addressed elsewhere (Opitz, in preparation).

Techniques of dissection, measurements, illustration, and terminology of anatomic structure are similar to those described in my previous revisionary works (Ekis, 1977: 6; Opitz, 2004: 7; 2005: 8). Label information of each primary type is presented in species descriptions in exact sequence and script as indicated on specimen labels. In descriptions, I refer to primary (1°) and secondary (2°) degree setae not in the sense that they might be used in larval ontogeny, but in the sense of physical prominence, with primary setae being much longer than the secondary setae. These setae are found on the elytral disc and are further defined as follows: primary setae are longer and more suberect than secondary setae, which are short to an extent that they give an impression of "setal mats" (Opitz, 2005: 80, fig. 260). Rows of punctations on the elytral disc are numbered such that the row nearest the sutural margin is considered row number 1. Species descriptions also include an itemization of the kinds of labels found beneath the holotype, further minimizing potential confusion of the primary type identity during future research. Specific epithets were coined or taken from the comprehensive work of Brown (1956).

Sister group relationships within *Decorosa* are based on principles as advocated by Hennig (1966), but I agree with Tuomikosky (1967: 138) who states that the terms *apotypic* and *plesiotypic* rather than *apomorphic* and *plesiomorphic* should be used on the grounds that evolutionary syntheses are not confined to structural character states. The apotypic or plesiotypic states of adult morphological characters are determined and organized into a character matrix. The data matrix was analyzed by hand, which represents strictly intuitive conclusions (fig. 44), and by use of NONA (Goloboff, 1993) in conjunction with Winclada version 1.00.08 (Nixon, 2002) (fig. 45).

Specimens are deposited in the following collections and copies of this contribution will be sent to their respective libraries:

AMNH	American Museum of Natural History, Department of Entomology, Central Park West at 79th Street, New York, New York 10024–5192 (Lee Herman; herman@amnh.org).
CMNH	Carnegie Museum of Natural History, Invertebrate Zoology, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213 (Robert Davidson; davidsonr@mus-nature.ca).
MAIC	Michael A. Ivie Collection, Montana State University, Department of Biology, Bozeman, Montana 59717; (Michael A. Ivie; mivie@montana.edu).
MCZC	Harvard University, Museum of Comparative Zoology, Department of Entomology, 26 Oxford Street, Cambridge, Massachusetts 02138–2902 (Philip Perkins, perkins@oeb.harvard.edu).
RHTC	Robert H. Turnbow, Jr., Collection, Directorate of Engineering and Logistics, Fort Rucker, Alabama, 36362–5000 (Robert H. Turnbow, Jr.; catch-bugs@aol.com).
USNM	United States Department of Agriculture, Systematic Entomology Laboratory, c/o National Museum of Natural History MRC 168, Washington, D. C. 20560–0165 (Natalia J. Vandenberg; nvandenb@sel.barc.usda.gov).
WFBC	William F. Barr Collection, 514 North Eisenhower Street, Moscow, Idaho, 83844; Willian F. Barr; 208-882-2886).
WOPC	Weston Opitz Collection, Kansas Wesleyan University, Department of Biology, 100 East Claflin Avenue, Salina, Kansas 67401–6196; Weston Opitz; opitz@kwu.edu).

CHARACTERS SELECTED FOR PHYLOGENETIC ANALYSIS

Fourteen anatomical characters serve to establish an intrageneric phylogenetic hypothesis of *Decorosa* species and to root the genus to its outgroup taxa. I relied on outgroup comparisons to establish character polarity. In

this treatise, the outgroup involves members of the genera *Amboakis* Opitz, *Ellipotoma* Spinola, *Hapsidopteris* Opitz, *Ichnea* Laporte, *Katamyurus* Opitz, *Madoniella* Pic, *Megatrachys* Opitz, *Parvochaetus* Opitz, and *Plocamocera* Spinola. Character states identified as "0" are judged plesiotypic whereas those given a value of "1" are considered apotypic. Derived character states marked by an asterisk identify *homoplasic apotypies*, a type of apotypy defined under "Materials and Methods".

Character 0 Seventh row of elytral punctations: (0) present throughout elytral disc; (1) absent in some portion of elytral disc

Character 1 Elytral color pattern: (0) not multiples of streaks; (1) multiples of streaks

Character 2 Labial terminal palpomere: (0) conic; (1) curved-rectangular

Character 3 Pronotal anterior transverse depression: (0) present; (1) absent*

Character 4 Pronotal contour: (0) convex; (1) flat

Character 5 Elytral punctations: (0) not binoded; (1) binoded*

Character 6 Configuration of elytral posterior margin; (0) obtuse; (1) acute*

Character 7 Eye size: (0) not small; (1) small

Character Vertex width: (0) not very wide; (1) very wide*

Character 9 Phallic apex: (0) not hooked; (1) hooked

Character 10 Form of sixth antennomere: (0) not expanded; (1) expanded

Character 11 Number of antennomeres: (0) not 11 (1) 10

Character 12 Phallic apex form: (0) not constricted at middle; (1) constricted at middle

Character 13 Elytral disc markings: (0) not sharply defined; (1) sharply defined

DECOROSA, NEW GENUS

TYPE SPECIES: *Decorosa iviei*, n. sp.

DIAGNOSIS: The known geographic distribution of the members of this genus is confined to the Dominican Republic. Morphologically, the most striking synapotypic characteristic that distinguishes the members of this genus is that there has been a reduction in expression of the seventh row of elytral punctations. The seventh row is absent in the anterior third or anterior half of the elytral disc (see figs. 24, 29). Also, the funicular antennomeres are filiform, and the vertex is wider (fig. 2) than in specimens of some of the superficially similar specimens of *Amboakis* Opitz (2006: 22), *Madoniella* Pic (1935: 10), and *Parvochaetus* Opitz (2006: 14).

Terminal palpomeres of the maxilla and labium may also be used to distinguish *Decorosa* specimens from those of other above-mentioned epiphloeines. For example, in *Madoniella* specimens the maxillary terminal palpomere is curved-subconic (fig. 36) whereas in *Decorosa* specimens it is curved-rectangulate (fig. 38). The labial terminal palpomere is conic in specimens of *Madoniella* (fig. 35), but slightly curved-conic in those of *Decorosa* (fig. 37). The cranium and pronotal disc are vested with short, pale, horizontally decumbent, silken setae, the elytral disc is very ornate with its pattern of yellow and brown markings (fig. 1), and the pronotum is longer than wide (fig. 7).

From superficially similar specimens of the genera *Madoniella*, *Amboakis*, and *Parvochaetus*, characterized by funicular antennomeres that are expanded (fig. 28), *Decorosa* specimens are distinguished by less bulgy eyes and a shallower medial border of the eye. Lastly,

TABLE 1
Character Matrix of 14 Morphological Characters

Taxa	Characters													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
outgroup-*Decorosa* stock	0	0	0	0	0	0	0	0	0	0	0	1	0	0
outgroup	0	0	0	0	0	0	0	0	0	0	1	1	0	0
aladecoris	1	1	1	1	0	1	0	0	0	0	0	1	0	1
limatula	1	1	1	0	1	1	0	0	1	1	0	1	0	0
iviei	1	1	1	0	1	1	1	1	1	0	0	1	0	0
neiba	1	1	1	1	0	1	0	0	0	0	0	1	1	0

in specimens of *Decorosa* the epipleural fold spans the entire length of the elytra (fig. 26), which is not the case in specimens of *Madoniella* (fig. 27), *Amboakis*, or *Parvochaetus*.

DESCRIPTION: *Size*: Length 3.5–5.6 mm; width 1.0–1.4 mm. *Form* (fig. 12): Elongate, narrow, rectangulate; pronotum elongate (fig. 7) or about as long as wide (fig. 12); elytra about three times longer than wide, epipleural margin subparallel, posterolateral margin gradually or sharply curved toward sutural margin. *Integument*: Cranium and pronotum light reddish brown to dark brown; elytra with intermixture of yellow and brown streaklike ornate patterns (figs. 1, 12–14); legs yellow, tibiae may be infuscated at their anterior margins; abdomen dark brown. *Vestiture*: Cranium and pronotum vested densely with short, pale, horizontally decumbent, silken setae, elytral disc vested with moderately stout, dark 1° setae, very uniform in length, and fine decumbent pale 2°, profusely distributed throughout elytral surface. *Head*: Cranium fine, rugosely punctate; eyes not very bulgy, finely faceted, ocular notch angle not acute at innermost point (fig. 2); antenna (fig. 4) inserted at lower angle of eye incision, comprised of 10 antennomeres, loosely clubbed, scape about as long as combined length of next three antennomeres, pedicel oblong, funicular antennomeres filiform, antennomeres 3–6 elongate, antennomere7 quadrate, antennomeres 8 and 9 triagonal, antennomere10 subglobose to ovate; labrum (fig. 5) deeply incised, incision bordered by eight setae; mandible (fig. 10) robust, anterior and posterior dentes well developed, mandibular penicillus poorly developed; maxilla (fig. 9) well developed, terminal palpomere curved-subconic, only slightly narrowed distally, laterolacinia present; labium (fig. 8) well developed, terminal palpomere curved-rectangular; frons planar; gula (fig. 3) subtrapezoidal. *Thorax*: Pronotum (figs. 6, 7) oblong or about as long as wide, pronotal lateral tubercle obtuse (fig. 12) or subacute (fig. 7); anterior margin convex, posterior margin linear, anterior transverse depression absent (fig. 1) or short (figs. 12–14), disc slightly depressed at sides where discal and paralateral trichobothria are prominent; epimeral prolongations slightly extended to middle; procoxal cavities open; elytra rectangulate, posterior portion of epipleural margin gradually or sharply rounded toward sutural margin, anterior half of disc surface macrosculptured with nine rows of punctations, posterior half macrosculptured with 10 rows of punctations, seventh row of punctations absent in basal half to basal third of disc (fig. 24); punctations large, sometimes binodal (fig. 25), and much wider than width of interstitial spaces; epipleural fold extends entire length of the elytra (fig. 26), posterior rounded portion of epipleural margin minutely spinous; metathoracic wing as in figure 23; mesoscutellum subquadrate; tibial spur formula 0-1-1, tarsal pulvilli formula 3-3-1, anterior margin of tibia with one to three spines; tarsal claws with large basal denticle. *Abdomen*: Six visible sterna; pygidium broad scutiform. *Male Genitalia*: Aedeagus short and broad, phallobasic apodeme short and broad, phallobasic rod usually tapered to a fine point, phallic plates very narrow; spicular fork as in figure 31.

DISTRIBUTION: This insular genus is known only from the Dominican Republic.

ETYMOLOGY: The genus name stems from the Latin adjective *decorus* ("beautiful") and the Latin feminine suffix *-a*. I refer to the stunning elytral color pattern of these beetles.

KEY TO DIFFERENTIATE *DECOROSA* FROM *AMBOAKIS* AND *MADONIELLA*, AND KEY TO SPECIES OF *DECOROSA*

Epiphloeinae checkered beetles have four trichobothria on the pronotum, two are dorsal-paralateral (fig. 33) and one occurs on each pronotal side. Also, the anterior margin of the protibiae exhibit one to many acute spines, which are not to be confused with the more coarse and obtuse spines found among some members of Enopliinae; the latter tend to be in the 8–15 mm body-size range whereas *Decorosa* specimens are usually about 4 mm. This key deals only with epiphloeines from Hispaniola.

1. Anterior half of elytral disc macrosculptured by 10 rows of punctations, or elytral disc somewhat roughened and densely matted with decumbent setae to extent that punctation organization poorly defined;

epipleural fold extended slightly beyond middle of elytra (fig. 27); elytral disc vested with bristlelike vertical setae 2

1′. Anterior half to anterior third of elytra macrosculptured by nine rows of punctations and by 10 behind middle, elytral disc never roughened or densely matted with decumbent setae; epipleural fold extended to elytral apex (fig. 26); elytral disc not vested with bristlelike vertical setae (*Decorosa*) 3

2(1). Funicular antennomeres subfiliform, fourth and sixth slightly expanded (fig. 29); elytra usually somewhat oblong-suboval (fig. 32). . . . . *Madoniella* Pic

2′. Funicular antennomeres very expanded (fig. 28); elytra usually narrow-rectangulate (fig. 30). . . . . *Amboakis* Opitz

3(1′). Seventh row of elytral punctations begins at about basal third of elytral disc, anterior to the plane of metacoxae 4

3′. Seventh row of elytral punctations begins near middle of elytral disc behind plane of metacoxae (fig. 24) 5

4(3). Cranium and pronotum uniformly dark brown; elytral markings as in figure 1 (Dominican Republic: La Vega). . . . . *Decorosa aladecoris*, n. sp.

4. Cranium and pronotum not uniformly dark brown, cranium narrowly reddish, brown at margins of eyes, pronotum narrowly red brown along anterior margin (Dominican Republic: San Juan). . . . . *Decorosa neiba*, n. sp.

5(3′). Pronotum narrow (figs. 13–14); apex of anterior protibial margin of right tibia with one stout spine; pronotal lateral tubercle subacute (fig. 7); elytral disc markings as in figures 13–14 (Dominican Republic: San Juan: Santiago). . . . . *Decorosa iviei*, n. sp

5′. Pronotum broad (fig. 12); pronotal lateral tubercle obtuse (fig. 12); apex of anterior protibial margin of right tibia with 2 spines; elytral markings as in fig. 12 (Dominican Republic: Azua). . . . . *Decorosa limatula*, n. sp.

DESCRIPTION OF *DECOROSA* SPECIES

Decorosa aladecoris, new species

Figures 1, 34, 39, 42, 46

HOLOTYPE: Female. DOMINIC. REP.: La Vega, Constanza, 1160 m, 30AUG1988, beating in secondary pine guava forest, M. A. Ivie, T. K. Philips & K. A. Johnson (USNM). (Specimen mounted on on minuten pin in neoprene block; gender label and metathoracic wing mounted on support card; locality label; holotype label).

PARATYPES: Three specimens: **Dominican Republic**: **La Vega**: Estación Cabanito, 20-VII-1996, R. Turnbow (RHTC, 1); Cordillera Central, 4.1 km SW El Convento, 18°50′N 70°42′W, 31-IV-2003, 1729 m, disturbed evergreen forest with pine canopy trap, J. Rawlins, R. Davidson, C. Young, C. Nuñez, P. Acevedo (CMNH, 1); Loma Casablito, 16.0 km NW Bonao, 19°02°N 70°31′W, 28-IV-2003. 1487 m, evergreen cloud forest at summit, canopy trap, J. Rawlins, R. Davidson, C. Young, C. Nuñez, P. Acevedo (WOPC, 1).

DIAGNOSIS: From congeners these beetles are distinguished by the uniform dark brown coloration of the cranium and pronotum, and by the color pattern on the elytral disc (fig, 1).

DESCRIPTION: *Size*: Length 4.0 mm; width 1.2 mm. *Integumental Color*: Cranium and pronotum dark brown; antennae yellow; elytra as in figure 1; legs yellow; venter dark brown. *Vestiture*: Cranium and pronotum densely vested with pale decumbent setae. *Head*: Vertex much wider than width of eye (27:13); ratio of head width to pronotal width 1.05 (62:59); antennal form similar to antenna depicted in figure 4. *Thorax*: Pronotum only slightly longer than broad (60:58); pronotal lateral tubercle obtuse; anterior margin conspicuously wider than posterior margin (58:50); apical region of protibial anterior margin with 3 spines; seventh row of elytral punctations begins slightly anterior to elytral middle. *Abdomen*: Aedeagus as in figure 34.

VARIATION: There is some variation in the extent of dark and light coloration in the most distal region of the elytral disc.

NATURAL HISTORY: Specimens were collected during May, July, and August, one by beating secondary vegetation in a pine/guava forest at 1160 m. Two specimens were captured in canopy traps, one in disturbed evergreen forest with pine at 1729 m, the other at the summit of an evergreen cloud forest at 1487 m.

DISTRIBUTION (fig. 46): Known only from the highlands of the La Vega Province of the Dominican Republic.

ETYMOLOGY: The specific epithet is a Latin compound name that stems from the noun *ala*

Fig. 1. Habitus of *Decorosa aladecoris* Opitz.

("wing") and *decoris* ("adorned"). I refer to the ornate markings on the elytral disc.

Decorosa iviei, new species

Figures 2–11, 13, 14, 19–26, 37–38, 46

HOLOTYPE: Female. DOMIN. REP: Prov. San Juan, Pico Duarte weather sta., 2885 m, 07APR.–08JUL 1992, lindgren funnel, M. A. & R. O. Ivie (USNM). (Specimen point mounted, gender label affixed to paper point; support card; locality label; holotype label.)

PARATYPES: Seven specimens. **Dominican Republic**: **La Vega**: Loma Rucilla & mountains, N, day not noted-VI-1938, 1524–2439 m, Darlington (MCZC, 2; AMNH, 1); 53 km SE Constanza, 9-VIII-1979, L. B. O'Brien (WFBC, 1); Parque Nacional Armando Bermudez, N Pico del Yaque, 29-VII-1993, 2375 m, beating vegetation, D. Sikes & R. P. Rosenfeld (MAIC, 2; WOPC, 1).

DIAGNOSIS: The more narrow pronotum, more angular lateral pronotal tubercle, singular spine on the anterior margin of the protibia, and configuration of the elytral pattern (figs. 13, 14) conveniently distinguish the members of this species from the superficially similar specimens of *Decorosa limatula*.

DESCRIPTION: *Size*: Length 3.8–5.8 mm; width 1.0–1.3 mm. *Integumental Color*: Cranium and pronotum light reddish brown; antennae yellow; elytra as in figure 13 and 14; legs predominantly yellow, tibiae infuscated; venter dark brown. *Vestiture*: Cranium and pronotum densely vested with pale decumbent setae. *Head*: Vertex about four times wider than width of eye (12:40); ratio of head width to width of pronotum 1.18 (67:57); antennae as in figure 4. *Thorax*: Pronotum only slightly longer than broad (60:58); pronotal lateral tubercle acute; side margins very sinuous; anterior margin conspicuously wider than posterior margin (56:47); apical region of protibial anterior margin with one spine. *Abdomen*: Aedeagus as in figures 19–22.

VARIATION: In one specimen the cranium and pronotum is dark brown rather than reddish brown and the expression of light and dark coloration of the elytral disc varies as indicated in figures 13 and 14. These figures represent the extremes in elytral color density among the species examined.

NATURAL HISTORY: Members of this species have been captured during June–August at altitudes ranging from 1524–2885 m.

DISTRIBUTION (fig. 46): This species is known from the highlands of the Cordillera Central of the Dominican Republic.

ETYMOLOGY: The trivial name is a dedicative patronym to express appreciation to Michael A. Ivie for his contributions to West Indian coleopterology.

Decorosa limatula, new species

Figures 12, 15–18, 46

HOLOTYPE: Female. Loma Vieja, S Constanza, Aug. '38, Dom. Rep., c. 6,000 ft., Darl. (MCZC). (Specimen point mounted, gender label affixed to paper point; support card; locality label; holotype label.)

PARATYPES: None.

DIAGNOSIS: The broadly flattened pronotum, less acute lateral pronotal tubercle, bispinous condition of the anteroapical margin of the protibia, and configuration of the elytral pattern (fig. 12) readily distinguish the members of this species from congeners.

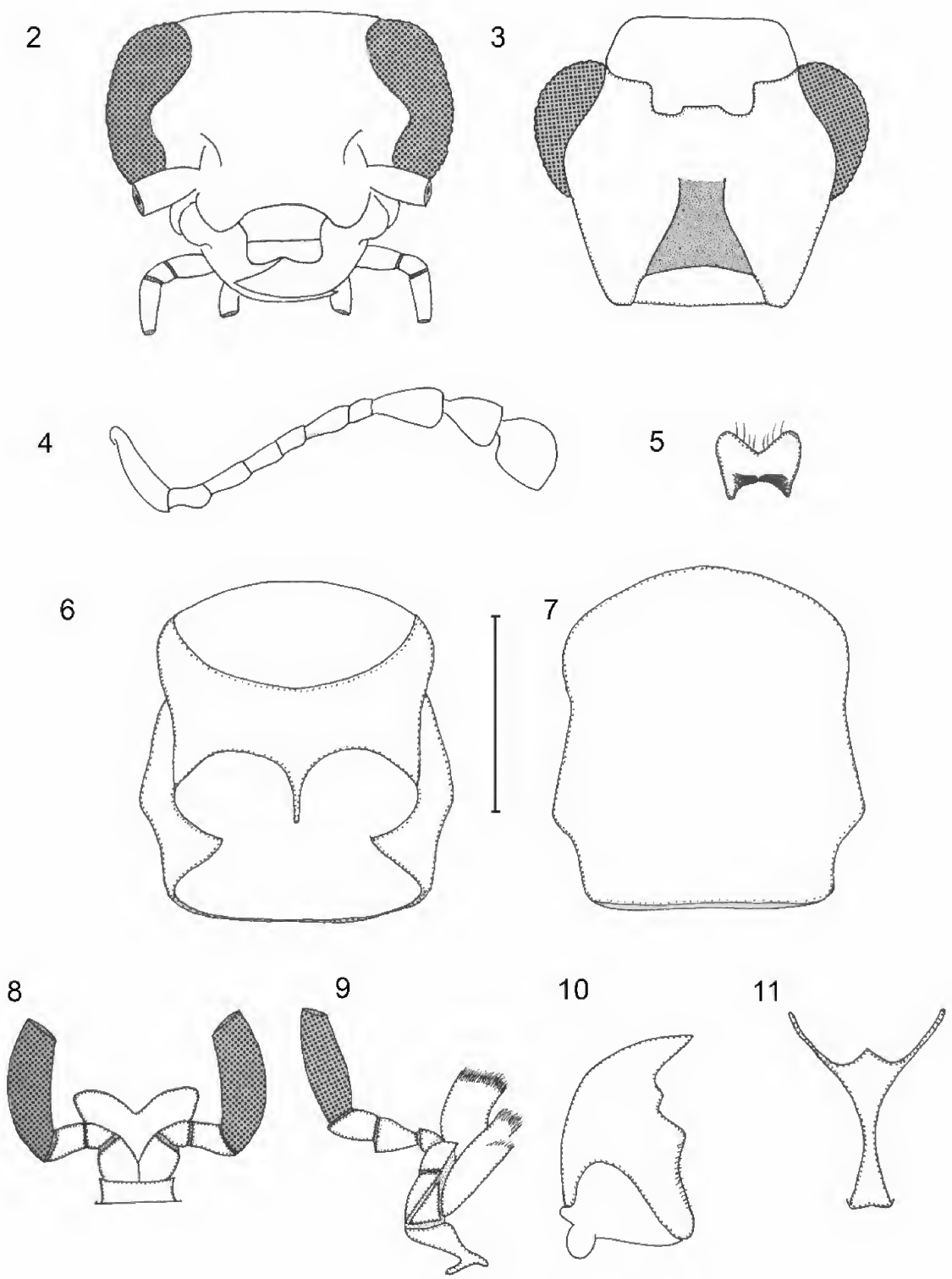
DESCRIPTION: *Size*: Length 5.0 mm; width 1.3 mm. *Integumental Color*: Cranium and pronotum light red-brown, vertex infuscated; antennae yellow; elytra as in figure 12; legs predominantly yellow, tibiae infuscated; venter dark brown. *Vestiture*: Cranium and pronotum densely vested with pale decumbent setae. *Head*: Vertex about two times wider than width of eye (19:34); antennae generally as in figure 4. *Thorax*: Pronotum only slightly longer than broad (70:68), broadly flattened; pronotal lateral tubercle obtuse; side margins not very sinuous; anterior margin conspicuously wider than posterior margin (65:60); protibial anteroapical region with two spines. *Abdomen*: No aedeagal information available.

VARIATION: One specimen examined.

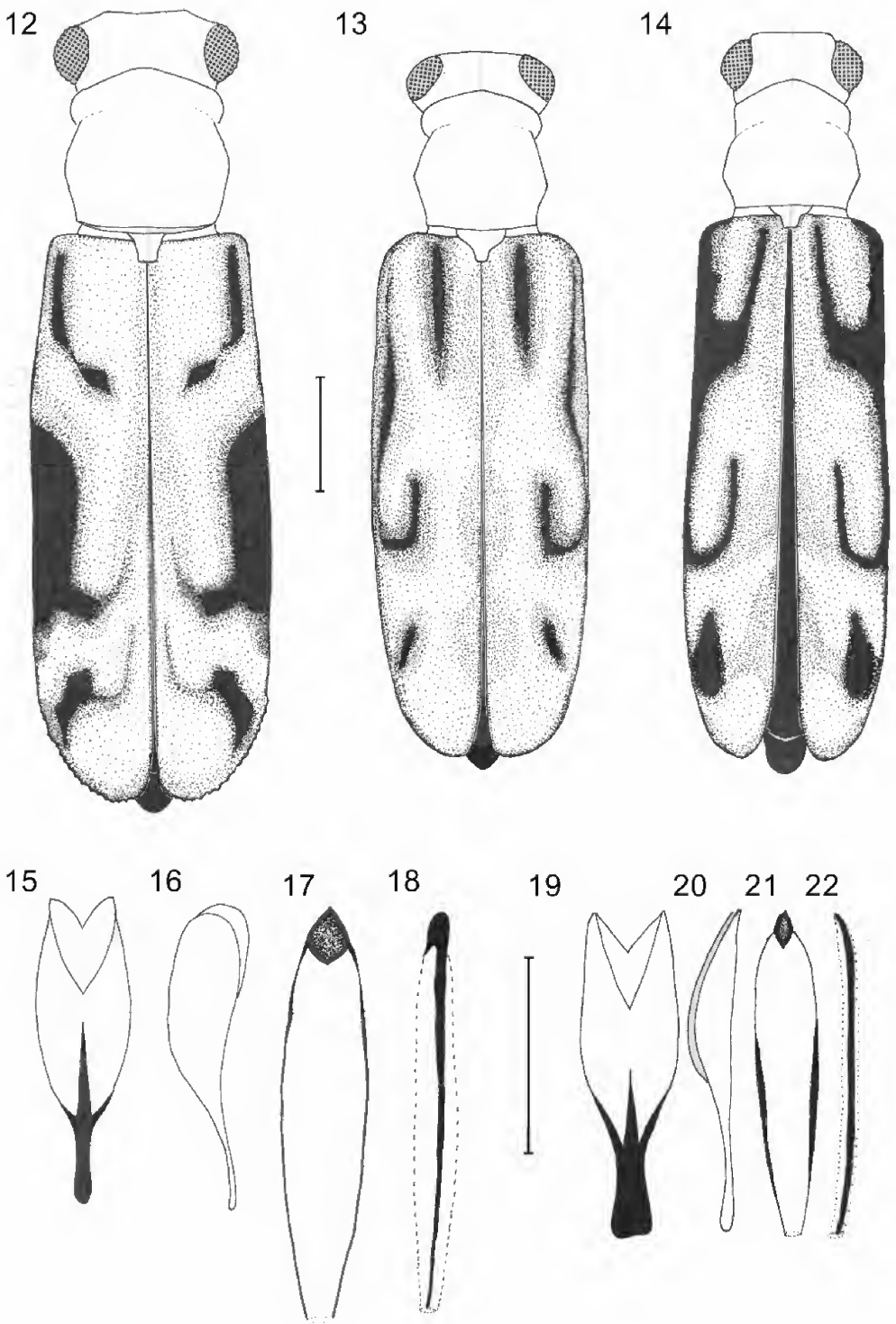
NATURAL HISTORY: The unique specimen was collected in August at 1829 m.

DISTRIBUTION (fig. 46): This species is known from the highlands of south-central Dominican Republic.

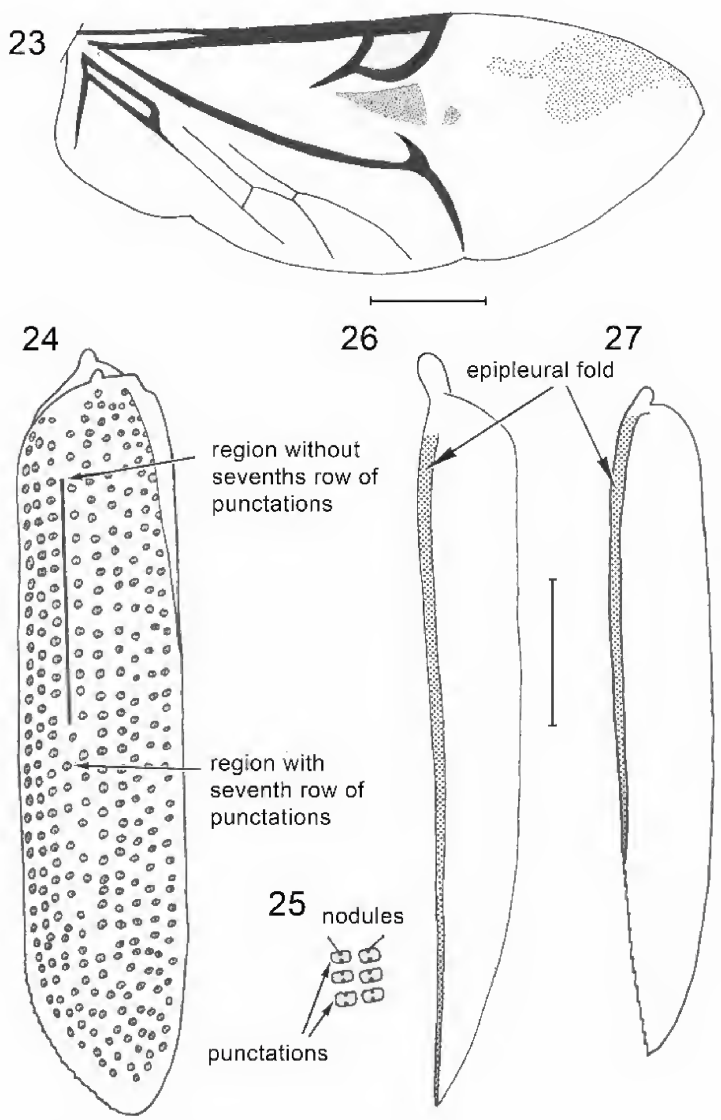
ETYMOLOGY: The specific epithet is a Latin adjective derived from *limatulus* ("rather polished") with a feminine ending to modify the genus name. I refer to the shimmering



Figs. 2–11. Anatomical organs of *Decorosa iviei* Opitz. **2.** Head (anterior view). **3.** Head (posterior view). **4.** Antenna. **5.** Labrum. **6.** Pronotum (ventral view). **7.** Pronotum (dorsal view). **8.** Labium. **9.** Maxilla. **10.** Mandible. **11.** Metendosternite. Scale bars in all figures represent 1 millimeter.



Figs. 12–22. Habiti and aedeagi. **12.** Habitus, *Decorosa limatula* Opitz. **13–14.** Habiti, *D. iviei* Opitz. **15–18.** Aedeagus, *D. limatula* (15, tegmen, ventral view; 16, tegmen, lateral view; 17, phallus, dorsal view; 18, phallus, lateral view). **19–22.** Aedeagus, *D. iviei* (19, tegmen, ventral view; 20, tegmen, lateral view; 21, phallus, dorsal view; 22, phallus, lateral view).



Figs. 23–27. Anatomical organs. **23–26.** *Decorosa iviei* Opitz (23, metathoracic wing; 24, elytra, ventral view; 25, cluster of elytral punctations; 26, elytra, lateral view). **27.** *Madoniella dislocata* (Say) elytra, lateral view.

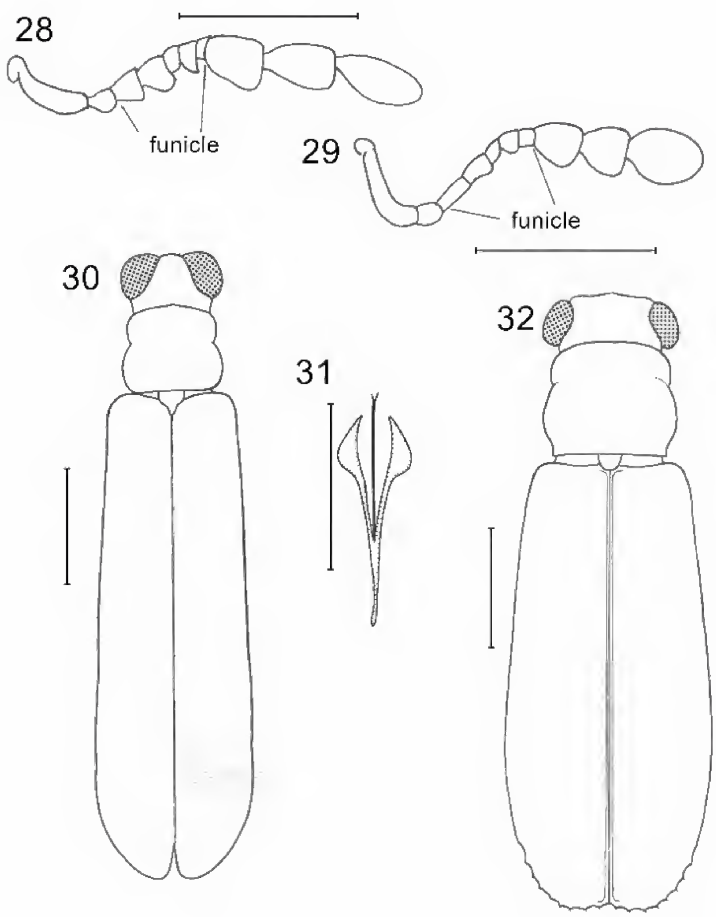
characteristic that the short pale decumbent setae bestow on the cranium and pronotal disc.

Decorosa neiba, new species

Figures 40, 41, 43, 46.

HOLOTYPE: Female. DOMINICAN REPUBLIC: Elias Pina. Cierra de Neiba, 9.1 km WSW Hondo Valle, 18-41-38N, 71-46-56W, 1856 m, 25 June 2003, J. Rawlins, C. Young, R. Davidson, C. Nunez, P. Acevedo, M. de la Cruz, wet montane forest with pine, malaise trap, Carnegie Museum Specimen Number CMNH-356.509 (CMNH). (Specimen minuten pin mounted on neoprene block; gender label and metathoracic wing mounted on support card; locality label; holotype label).

PARATYPES: One specimen: **Dominican Republic**: **San Juan**: Sierra de Neiba, 9.4 km SSW El Cercado, 18° 39′N 71° 32′W, 22-VI-2003, 1974 m, mature pine forest, Malaise trap, R. Davidson, C. Nuñez, C. Young, J. Rawlins, P. Acevedo, M. de la Cruz (WOPC, 1).



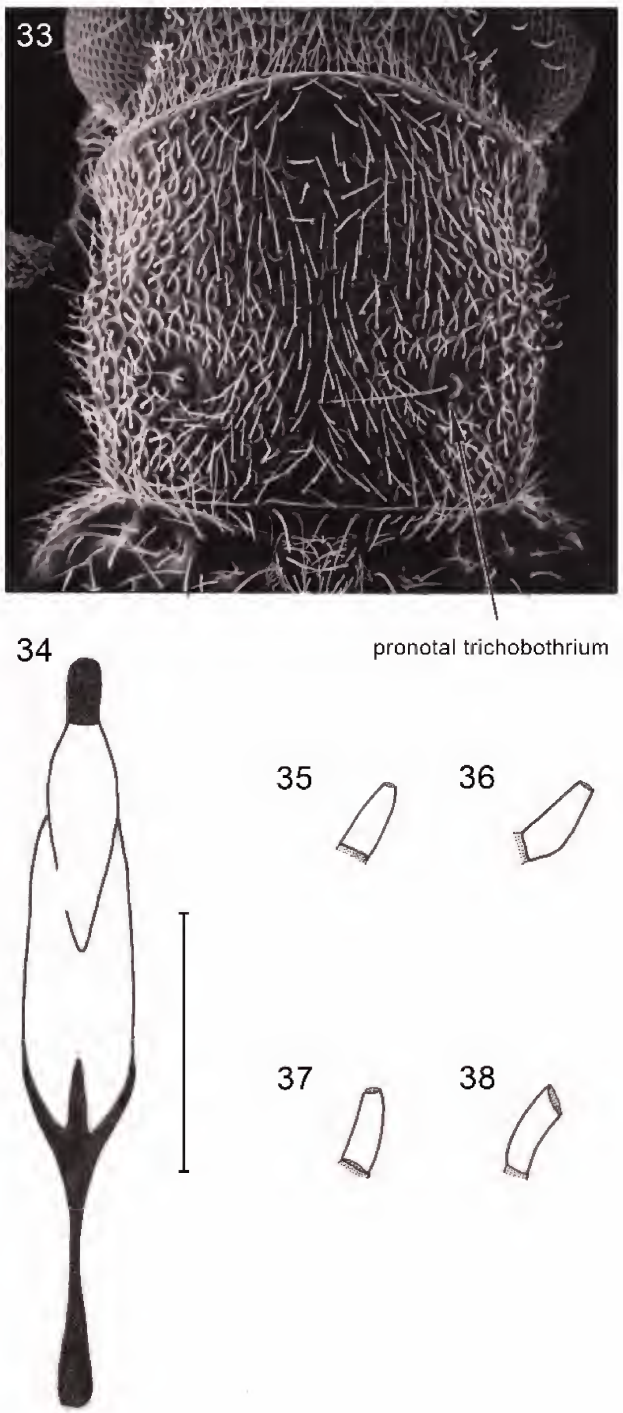
Figs. 28–32. Anatomical structures and body outlines. **28.** *Amboakis nova* (Opitz) antenna. **29.** *Madoniella dislocata* (Say) antenna. **30.** *A. nova* body outline. **31.** *Decorosa iviei* Opitz spicular fork. **32.** *M. dislocata* body outline.

DIAGNOSIS: From superficially similar specimens of *D. aladecoris*, *D. neiba* specimens may be distinguished by the shape of the pronotum. Specimens of *A. neiba* have a proportionally wider pronotal posterior margin (compare figs. 42, 43). From other congeners these beetles are distinguished by the bicolorous coloration of the pronotum; the disc is dark brown and the anterior margin is reddish brown.

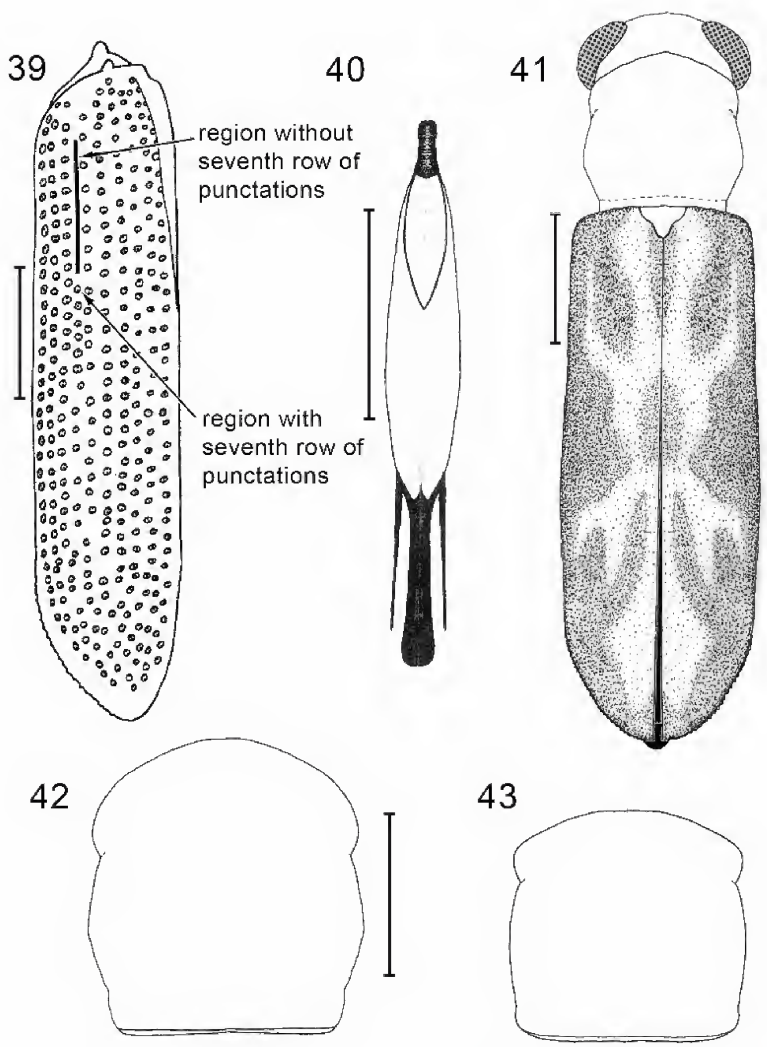
DESCRIPTION: *Size*: Length 4.0–4.2 mm; width 1.6–1.8 mm. *Integumental Color*: Cranium and pronotum bicolorous, cranial disk dark brown, periphery reddish brown, pronotal disc dark brown, anterior margin reddish brown; antennae unicolorous, mostly yellow, some funicular articles infuscated; elytra as in figure 41; legs mostly yellow, femora and tibiae infuscated; venter dark brown. *Vestiture*: Cranium and pronotum densely vested with pale decumbent setae. *Head*: Vertex much wider than width of eye (13:25); ratio of head width to pronotal width 1.06 (57:54); antennal form similar to antenna depicted in figure 4. *Thorax*: Pronotum only slightly longer than broad (53:52); pronotal lateral tubercle obtuse; anterior margin slightly wider than posterior margin (48:47); apical region of protibial anterior margin with three spines; seventh row of elytral punctations begins slightly anterior to elytral middle. *Abdomen*: Aedeagus as in figure 40.

VARIATION: The available specimens are quite homogeneous.

NATURAL HISTORY: The two available specimens were collected in a Malaise trap in



Figs. 33–38. Anatomical structures. **33.** forebody of *Madoniella dislocata* (Say). **34.** Aedeagus of *Decorosa aladecoris* Opitz. **35–36.** *Madoniella dislocata* (35, terminal labial palpomere; 36, terminal maxillary palpomere). **37–38.** *D. iviei* Opitz (37, terminal maxillary palpomere; 38, terminal labial palpomere.



Figs. 39–43. Anatomical organs and habitus. **39.** *Decorosa aladecoris* Opitz elytra, ventral view. **40–41.** *D. neiba* Opitz (40, aedeagus; 41, habitus). **42.** *D. aladecoris*, pronotum. **43.** *D. neiba*, pronotum.

mountain forest laden with pine, at 1857 and 1974 m.

DISTRIBUTION (fig. 46): Known only from the highlands of Sierra de Neiba, in the San Juan Province of the Dominican Republic.

ETYMOLOGY: The trivial name, *neiba*, constitutes a noun in apposition and refers to the type locality.

REVIEW OF GREATER ANTILLEAN AND HISPANIOLOAN PALEOGEOGRAPHY

The literature is rich in facts, ideas, and syntheses about Caribbean biogeography/geology (Schwartz, 1980; Rosen, 1985; Liebherr, 1988; Mann et al., 1991; Donovan and Jackson, 1994; Woods and Sergile, 2001, and references therein) and more specifically about insect Hispaniolan zoogeography such as Woodruff and Sanderson (2004: 26). These stimulating contributions inspire attempts to make biographical sense of one's taxonomic findings. My intent for this review of Antillean paleohistory is to provide a baseline of thoughts, along with additional comments related to insect findings, and summary for this and future analyses of Caribbean Cleridae taxa.

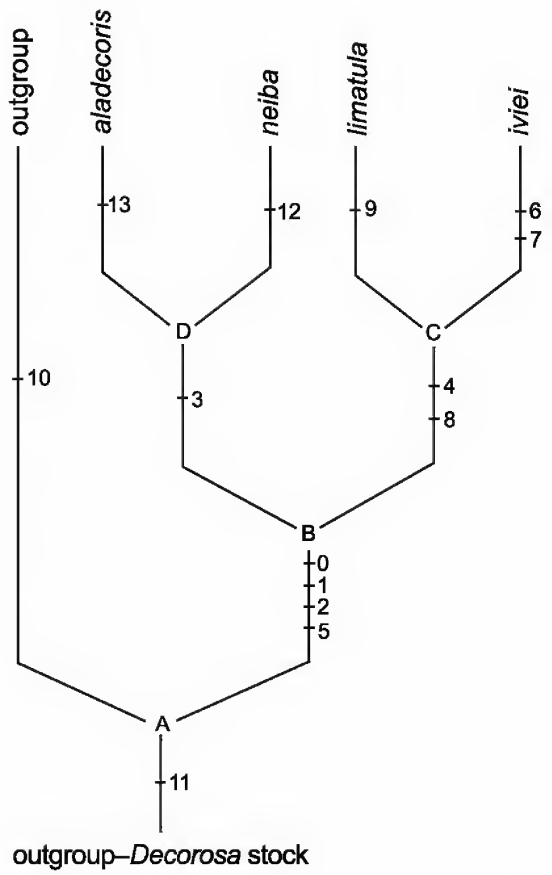


Fig. 44. Phylogenetic tree of *Decorosa* Opitz and related taxa; manually prepared.

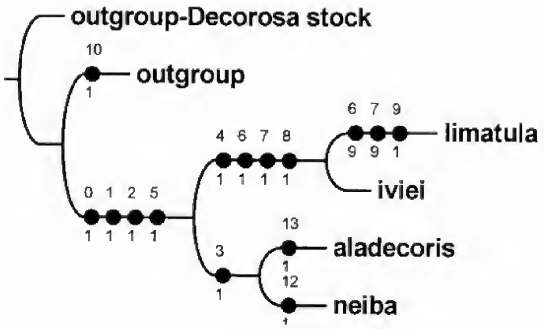


Fig. 45. Phylogenetic tree of *Decorosa* Opitz and related taxa; computer generated.

There is strong evidence from geology (Khudoley and Meyerhoff, 1971: 129; van Fossen and Channell, 1988: 610; Perfit and Williams, 1989: 67; Heubeck et.al., 1991: 29; Draper et al.,1994: 143) and biology (Williams, 1961: 2; Schwartz, 1980: 87, 1989: 489; Rosen, 1985: 652; Liebherr, 1988: 143; Woodruff and Sanderson, 2004: 27) to support the hypothesis that Hispaniola was once comprised of two islands, and that the northern part originated from an early Cretaceous-Eocene assemblage of insular rock whereas the southern portion originated from oceanic plateau rock, essentially the uplifted edge of Caribbean sea crust (Draper et al., 1994: 129). The two-island hypothesis and the prehistoric movement of the two landmasses that constitute Hispaniola have been incorporated into a paleogeographic model of West Indies mobility (Pindell and Dewey, 1982: 202; Sykes et al., 1982: 10,669; Wage and Burke, 1983: 633; Rosen, 1985: 652; Perfit and Williams, 1989: 67; Pindell and Barrett, 1990: 405).

To explain biologic relationships between the northern and southern elements of Hispaniola, and those between Hispaniola and any other West Indies landmass, we must explore what is known about the geology and the paleotectonic and neotectonic events that eventually led to the island's amalgamation. Moreover, the relative geologic ages of the two prehistoric landmasses is relevant to any discussion of their biogeography.

Donnelly (1988: 26) places the initial emergence of Greater Antillean terrain during the upper lower Cretaceous, about 105 Ma with Hispaniolan and Jamaican rocks included in the mix. Khudoley and Meyerhoff (1971: 152) suggest that "Most of the Greater Antilles were uplifted in the Miocene and later times." Early Cretaceous rock elements in northern Hispaniola and late Cretaceous rock elements for the southwestern part of the island were reported by Draper et al. (1994: 129). This suggests that at least some portions of the crustal component of the Hispaniolan northern island may be more ancient than its southern counterpart. Rocks of the late upper Cretaceous (Maastrichtian stage, about 70 Ma) have been reported as a component of the southwestern Sierra de Bahoruco (Draper et al., 1994: 139). Of considerable relevance to the question of age of the southern portion of Hispaniola is the gymnosperm and angiosperm fossil discovery by Woodruff (1986: 32; also see Woodruff and Fritsch, 1989: 216) from the Larimer deposits

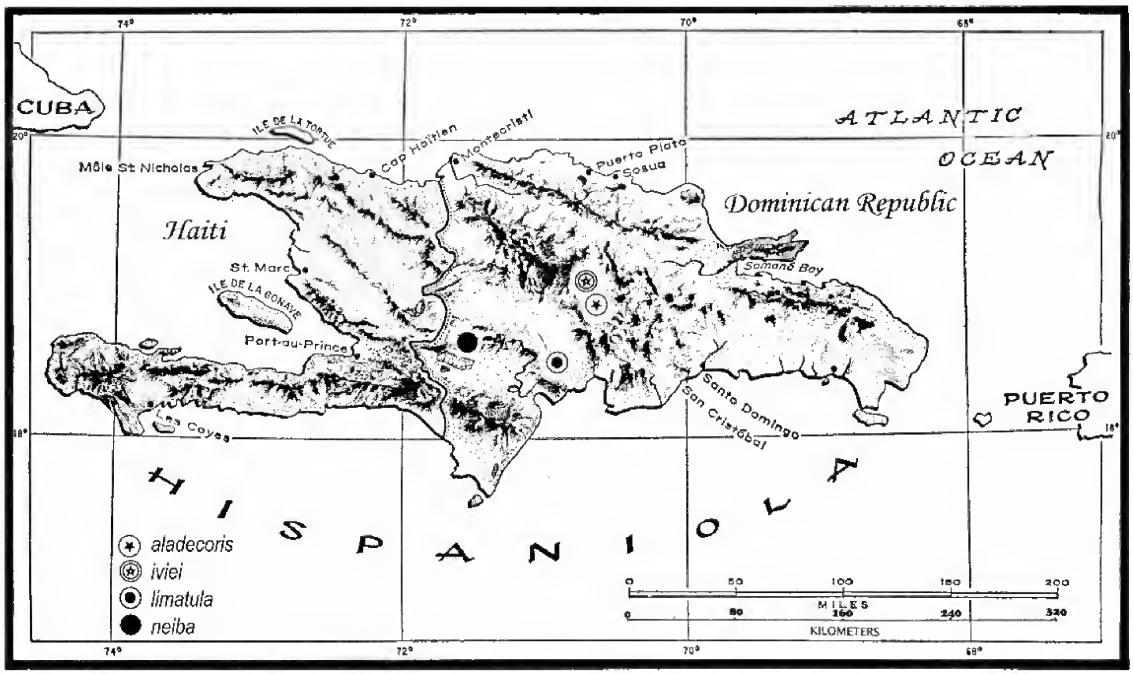


Fig. 46. Geographic distribution of *Decorosa* Opitz species.

of the Sierra de Baoruco considered Cretaceous by De Leon (1989: 85).

It has been hypothesized that Hispaniola's southern terrain was in proximity with the Yucatán peninsula (Rosen, 1985: 644) during early Eocene to late Paleocene (from 50–65 Ma) and that crustal movements, involving fault generated tectonics, between the Caribbean and North American plates carried southern Hispaniola to its eventual welding with the northern Hispaniolan component; an amalgamation purported to have occurred during early Miocene (about 20 Ma) (Heubeck et al., 1991: 29). Depending on one's starting point, this means that the two islands have been separated from 35 to 85 million years of Caribbean evolution. And, while both islands experienced tumultuous geologic changes (Donnelly, 1988: 27), likely environmental stresses from a bolide impact (Hedges, 2001: 19; Opitz, 2005: 108), and presumably vicissitudinous climates (Clench, 1963: 257), which must have had significant impacts on speciation and extinctions (Curtis et al., 2001: 50; Morgan, 2001: 398), the aforementioned time span represents a wide window of opportunity for independent biologic evolution.

Moreover, during their eastward tectonic journey, the terrestrial components of Hispaniola would have experienced the kind of fault-based shifting and rotation that would have placed them in close geographic relationships with other Greater Antillean terrain. Draper and Barros (1988: 60, 1994: 82) suggest late Eocene geologic ties between Cuba and Hispaniola and based on Lygaeidae findings Baranowski and Slater (1998: 75) suggests vicariance between Cuba and Hispaniola, and possibly Puerto Rico. In a treatise of plant phylogeny involving trees and shrubs of *Lyonia* (Ericaceae), Judd (2001: 72) discusses geologic relationships between western Cuba and southwestern Hispaniola and biotic relationships among Puerto Rico, north-central Hispaniola, and eastern Cuba.

If the welding of northern and southern Hispaniola occurred some 20 Ma (Heubeck et al., 1991: 29) and speciation events requires about 3 million years, as suggested by Whitehead (1972: 308) in his work with ground beetles, then biologists interested in

Hispaniolan beetle evolution have some measure for the temporal character of lower taxa divergence. This would be particularly useful for temporal analyses involving sister-group relationships between northern and southern Hispaniola and vicariant relationships among taxa from Hispaniolan and those of other Greater Antillean terrain.

DECOROSA EVOLUTIONARY CONSIDERATIONS

Two phylogenetic trees (figs. 44 and 45) were produced for *Decorosa*, one (fig. 44) prepared "by hand" and the other (fig. 45) computer generated. The computer analysis generated one parsimonious tree of 29 steps, CI of 100, and an RI of 100. Both phylogenies produced identical pairs of *Decorosa* sister species.

Paucity of *Decorosa* specimens and few distributional records usually preclude comprehensive discussion about phylogeny and zoogeography. But even a few tentative comments might be beneficial for future endeavors about the subject. Hispaniola has benefited from a flurry of entomological activities in recent years (Schwartz, 1989: 489; Woodruff and Sanderson, 2004: 1; and various communications with insect collectors) and there has evolved a greater awareness of insect diversity in the Caribbean (Liebherr, 1988). Some of these activities include greater insect collecting efforts, which have resulted in greater availability of Cleridae specimens.

The four *Decorosa* species are known only from the northern highlands of Hispaniola (fig. 45) with *D. limatula*, the sister species of the more northern *D. iviei* found in highlands east of Sierra de Neiba slightly north of the Enriquillo basin. *Decorosa aladecoris* and *D. neiba*, the more primitive members of the genus, are undoubtedly sympatric with the most derived *D. iviei*, which at the very least suggests some dispersal element in the early history of the genus.

As *D. limatula* is known from environs slightly north of the Enriquillo basin, one might presume a vicariant relationship between *D. limatula* with the more northern sister species *D. iviei*, as is the case between *D. aladecoris* and *D. neiba*. Discovery of *limatula* specimens from south of the Enriquillo basin would certainly support that possibility, and corroborate the likely north-south vicariance findings of Mertens (1939: 12), Williams (1961: 2), Schwartz (1980: 90), Judd (2001: 69), and Woodruff and Sanderson (2004: 26). As the most primitive members of the genus were collected from the northern portion of Hispaniola, I suspect that the northern component of the two paleoislands served as the ancestral terrain of the genus in which ancestral *Decorosa* stock B diverged to produce the *aladecoris-neiba* lineage and the more derived *limatula-iviei* lineage (fig. 44). More widespread northern collections of additional *D. aladecoris* and *neiba* specimens or absence of such material from the southern island would support the hypothesis and more credibly root the initial geographic divergence of the genus. Sister-group relationships of insect taxa between these two formerly insular highlands have been confirmed in Scarabaeidae (Woodruff and Sanderson, 2004: 26) and in butterflies (Schwartz, 1989: 489; Sourakov, 2000: 79).

The putative absence of *Decorosa* from western and southwestern Hispaniola could be a consequence of collecting bias or simply that captured specimens are unknown to me. I, like many other biologists, fear that extensive deforestation has eliminated a substantial Hispaniolan insect fauna, especially from western portions of the island (Sergile and Woods, 2001: 547).

The divergence of ancestral *Decorosa* yielded the *aladecoris* line, which retained several primitive characteristics including normal eye size and nonnodal elytral punctations while acquiring an apotypic convex pronotum and loss of the pronotal anterior transverse depression. The sister taxon of this lineage, ancestor C, would have evolved a more flattened pronotum, the eyes became significantly reduced, and the elytral punctations acquired a binodal characteristic. This ancestor eventually yielded *D. limatula* and *D. iviei* each characterized as indicated in fig. 44. It remains to be seen whether *D. limatula* dispersed to southern portions of prehistoric Hispaniola from northern ancestral grounds, or whether the north-south distribution record

of the *limatula-iviei* lineage expresses some manner of disjunction between the paleoislands of Hispaniola.

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